

Coastal Engineering Technical Note



Revised Wave Information Study (WIS) Results
for the
U S Atlantic Coast 1956-1975

INTRODUCTION

WIS has supplied wave climate information at locations along the U S Atlantic coast based on the 20 year period 1956-1975, (Corson, et. al., 1981), (Corson, et. al., 1982), (Jensen, 1983). This information meets a critical need for wave information in coastal engineering studies. Wave measurements made by the National Oceanic and Atmospheric Administration (NOAA) and Corps of Engineers (CE) during the 1980's makes a better verification of the WIS results possible by comparing statistics for the two different time periods, for example (Miller and Jensen, 1990), and (Hagerman, personal communication, 1988). These comparisons (both for the North Carolina coast) indicated that the distribution of hindcast wave heights and periods differed from the distributions of measured data. The directional distribution of wave energy from a year's measurements by a directional buoy at Kingsbay, GA was compared to WIS results by CERC. Again differences were noted. Others, (Weggel, Douglass, and Tunnell, 1988) also noted "unrealistic" behavior in some of the WIS results.

A one year hindcast for the Atlantic was done for 1988, using as nearly the same technique and model as in the original hindcast, (Lin and Wang, 1990). Hindcast results were compared to NOAA buoy and nearshore CE wave gage measurements. Heights compared well, but periods and directions differed more significantly. The present version of the WIS wave model WISWAVE improved the comparisons.

These comparisons led to the decision to revise the WIS information for the Atlantic coast for the period 1956-1975. This CETN briefly summarizes the procedure used in the revision, verification of the model prior to and after the calculations, and available results. A more detailed discussion and the tabular summary of results will be available in WIS Report 30, (Hubertz, Brooks, Brandon, and Tracy, in preparation).

REVISED HINDCAST PROCEDURE

The distributions of hindcast wind speeds and directions from the period 1956-1975 were compared to values available from buoy measurements in the 1980's. Some other comparisons of short duration, but coincident in time, also were made. Both comparisons led to the conclusion that the original hindcast winds are an accurate representation of the winds over the Atlantic during 1956-1975. Thus, the original winds were used for the revised hindcast.

The latest version of the WIS wave model, WISWAVE 2.0, WIS Report 27 (Hubertz, in publication) and the CRAY computer system at CERC were applied in this revision. This allowed doubling of the resolution of the original hindcast. The nested grid option of WISWAVE was employed using two levels, one covering the North Atlantic Ocean with a grid of 1 degree in latitude and longitude, and the other, the continental shelf with a grid of 1/4 degree. Locations at which wave information is available are shown in Figure 1. Deep water was assumed in level 1, and bathymetry at mean low water was used in level 2. The islands and shoals off the south east coast of Florida were included in the depth grid. The values of the coefficients in WISWAVE were the same as used in the Great Lakes hindcasts, WIS Reports 22-26.

VERIFICATION

A one year hindcast for 1990 was completed prior to recalculating the 20 years of wave information in order to verify the model and procedures used in the hindcast. Model results were compared to measurements at 14 locations along the Atlantic coast. The difference between measured and hindcast (buoy-model) monthly mean spectral wave height varied from 0.3 to -0.8 meters, with an average difference of -0.2 meters. The difference between measured and hindcast (buoy-model) monthly mean peak wave period varied from 1.8 to -3.6 seconds, with an average difference of -0.6 seconds. The range and mean monthly root mean square difference for height were 0.3-1.1 and 0.5 meters and for period were 0.4-4.8 and 2.5 seconds. The complete tables of statistical comparisons and sample comparison plots are presented in WIS Report 30.

A verification of results for the 20 year hindcast is shown in Figure 2a, b, c. The distribution of heights, Figure 2a, in 0.5-meter categories (0.0-0.49, 0.5-0.99, etc.) is plotted for the original Atlantic hindcast phase III station 132 (AP3), the revised Atlantic level 2 (RAL2) station 28, and NOAA buoy 41008. This is the only location on the Atlantic coast where old and revised hindcast results are at the same location as measured directional wave results. Hindcast results are for the years 1956-1975, buoy results are for the years 1988-1991. The locations are shown in Figure 1. The depths at AP3, RAL2, and 41008 are 10, 11, and 18 meters, respectively. The distribution of periods in 1-second intervals (0-3.0, 3.1-4.0, etc.) is shown in Figure 2b, and directions in 10-degree intervals (0-9.9, 10-19.9, etc.) in Figure 2c. Considerable improvement of the revised over the original results is apparent in the distribution of heights and directions. The period histogram bands are generally within 5% of each other for all bands.

RESULTS

Hindcast results are available at the locations shown in Figure 1. Results are available as time series for the 20 year period or as tabular summaries similar to previous WIS reports. Time series results are available every three hours. Each record contains, in order, station number, date-time, spectral wave height, peak and mean period, mean direction, wind speed and direction, the frequency spectrum, and the mean direction in each frequency band. The format of the output records is described in detail in WIS Report 27. The record format was designed to provide basic wave information such as height, period and direction, as well as a more complete spectral description of wave conditions. The entire 20 year time series at a station can be provided in compressed form on two high density 3 1/2 inch computer disks

along with a PC program to extract ASCII files of desired variables, plot time series of variables and plot spectra for various times. Time series, the display program, and documentation of the data are available upon request to the WIS project office (601-634-2028, Dr. Jon Hubertz). The summary report is scheduled for publication in November 1992.

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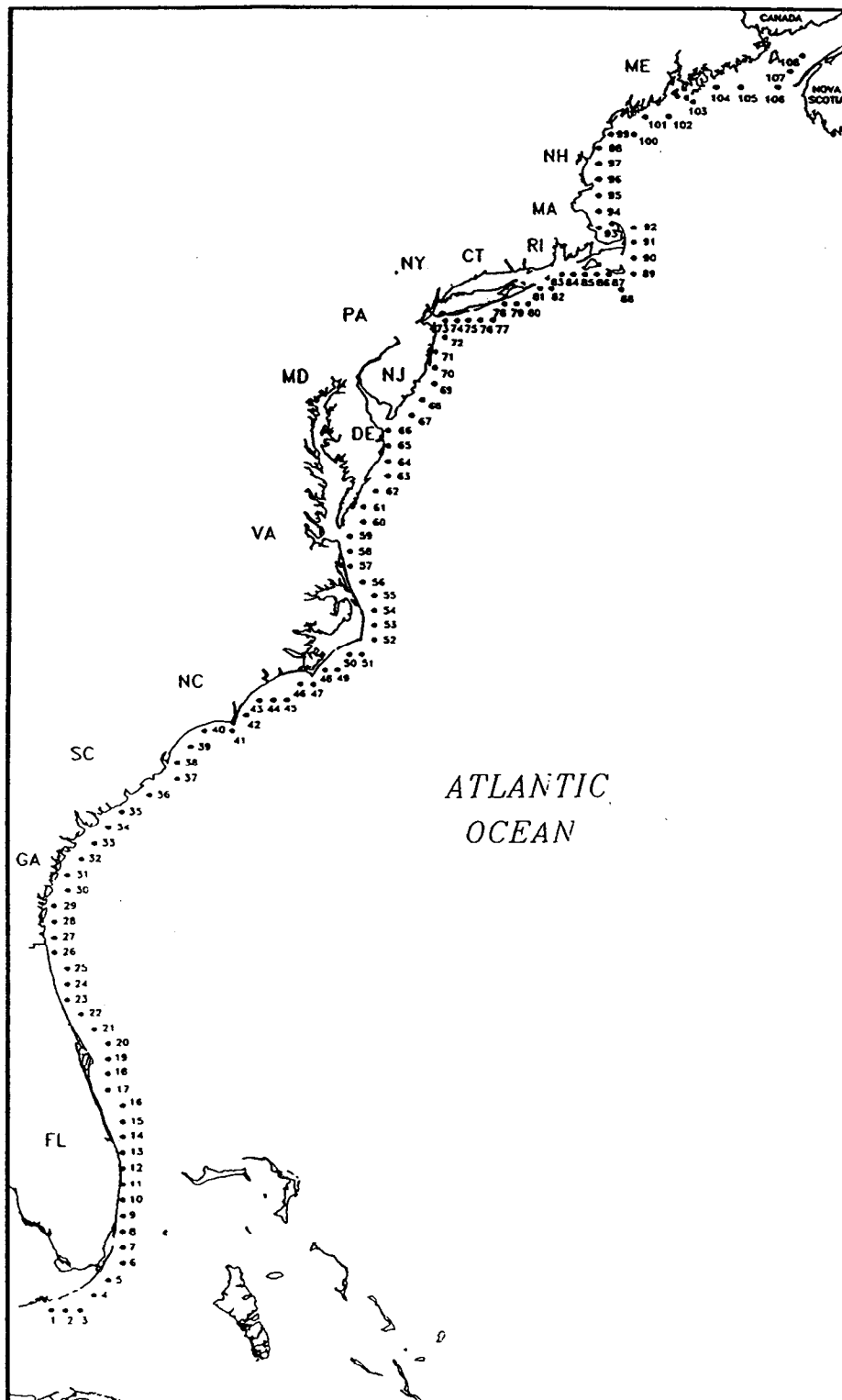


Figure 1 Locations (numbered dots) at which wave information is available from the revised Atlantic WIS hindcast.

KINGS BAY, GEORGIA

RAL2 28 vs AP3 132 vs NOAA 41008

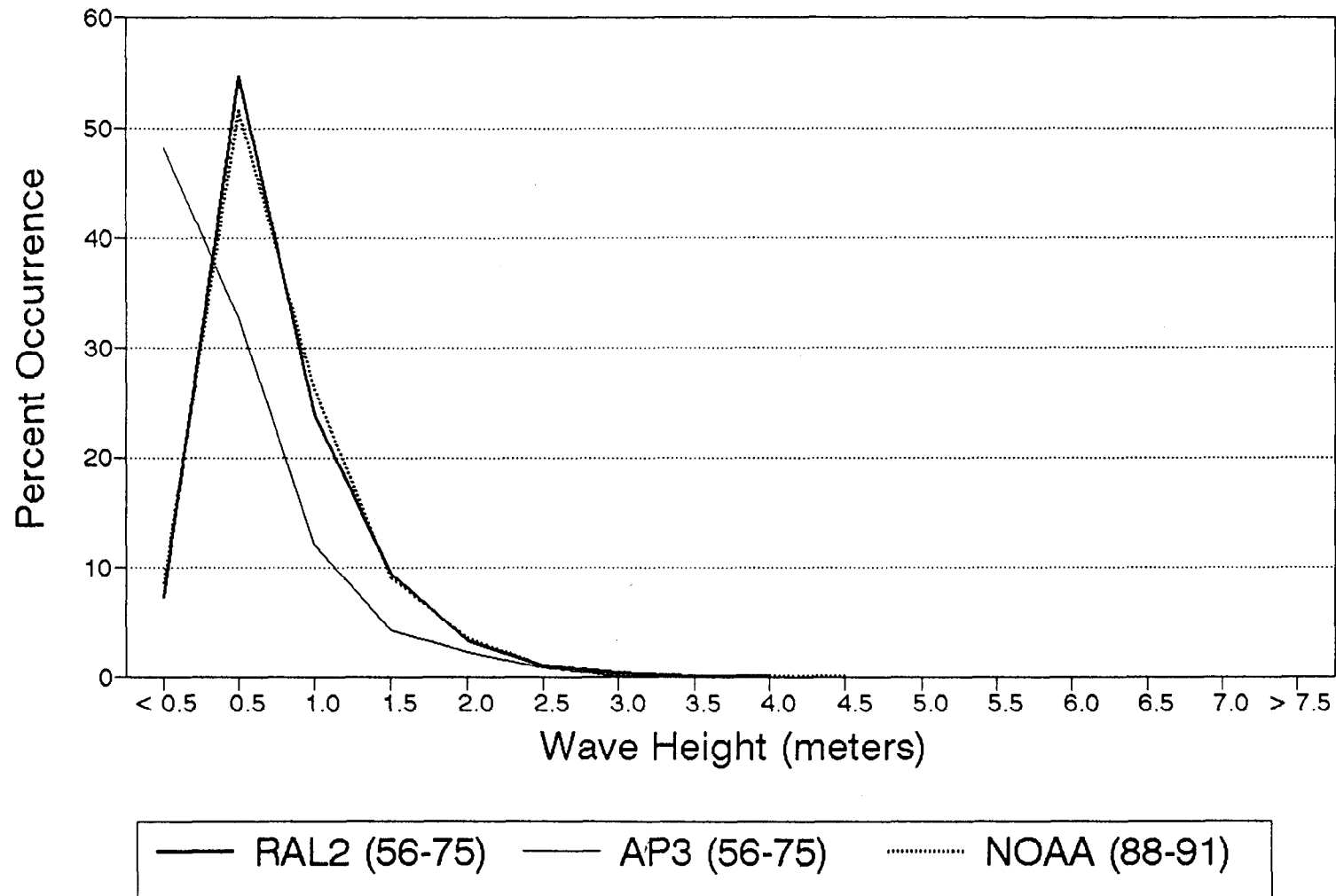


Figure 2a Comparison of Hindcast and Measured Wave Heights

KINGS BAY, GEORGIA

RAL2 28 vs AP3 132 vs NOAA 41008

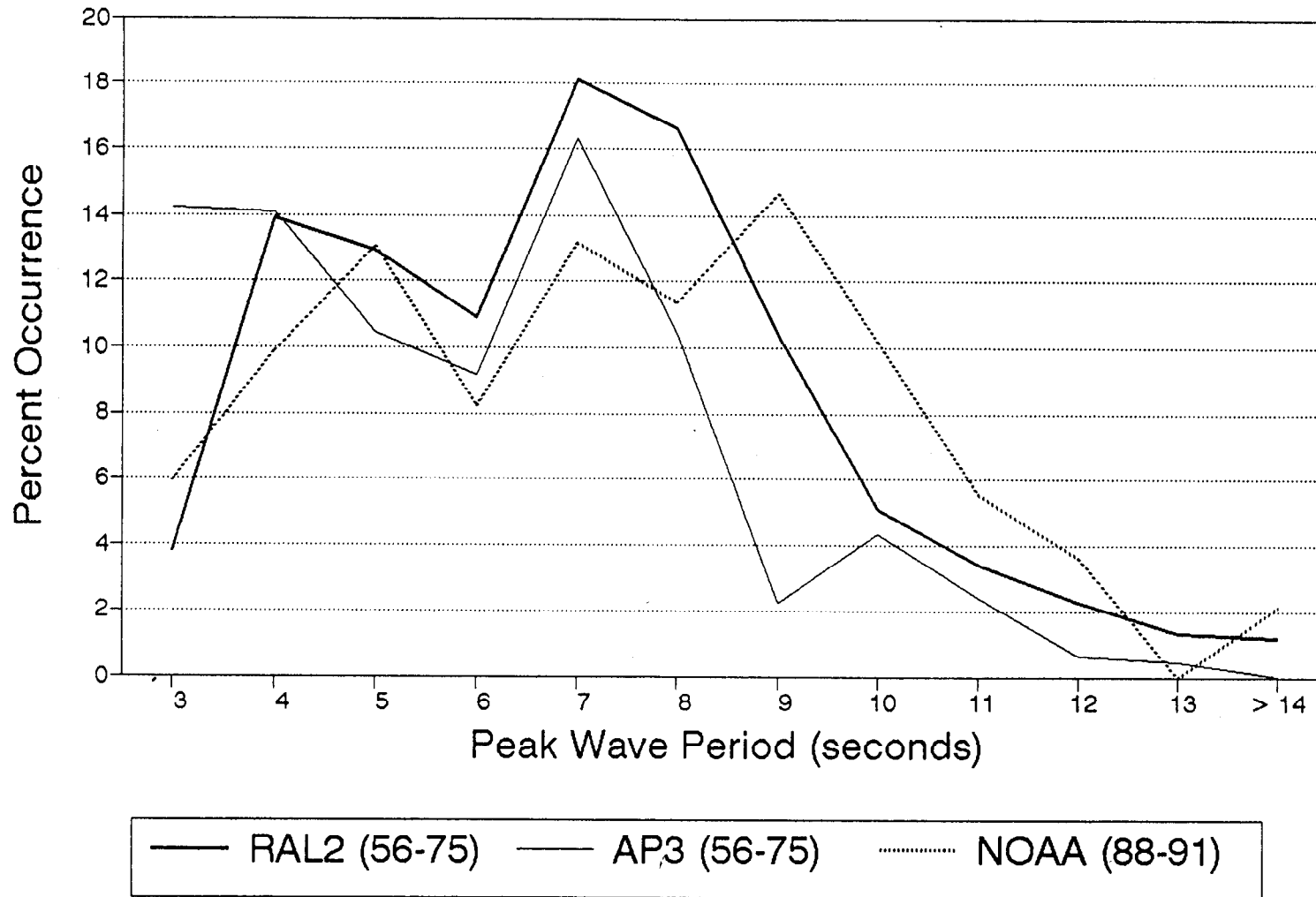


Figure 2b Comparison of Hindcast and Measured Wave Periods

KINGS BAY, GEORGIA

RAL2 28 vs AP3 132 vs NOAA 41008

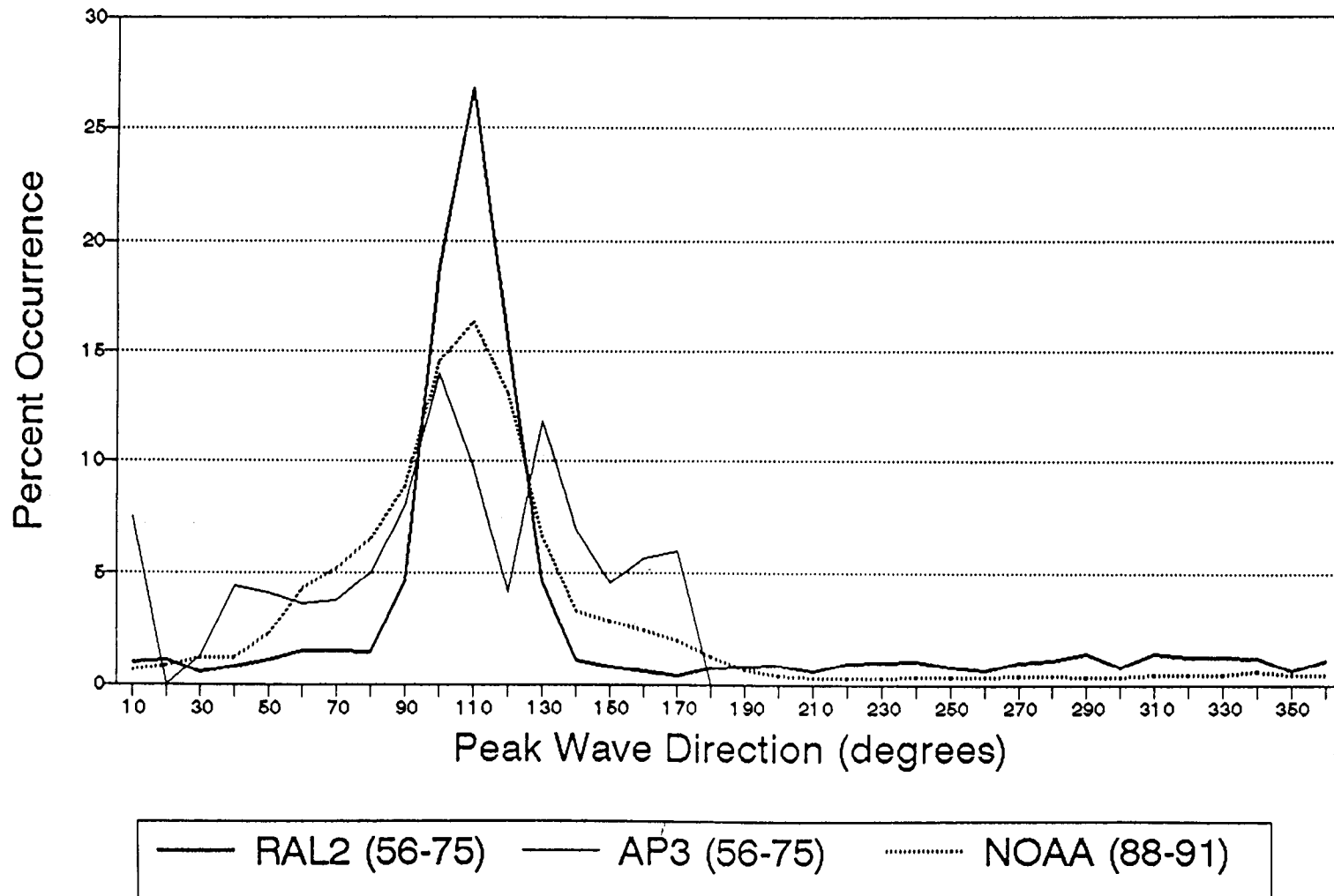


Figure 2c Comparison of Hindcast and Measured Wave Directions